

REMARKS

The foregoing Amendment and remarks which follow are responsive to the Final Office Action mailed August 14, 2006, in which the Examiner rejected Claims 1-4, 7, 11-16, and 20, and objected to Claims 5, 6, 8-10, and 17-19. More particularly, Claims 1-3 and 7 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,497,032 to Tsuji, et al. (hereinafter "TSUJI") in view of U.S. Publication No. 2004/0089926 to Hsu et al. (hereinafter "HSU"). Claims 11-13 and 15 were rejected under 35 U.S.C. §103(a) as being unpatentable over TSUJI, with Claims 4 and 20 being rejected under 35 U.S.C. §103(a) as being unpatentable over the combination of TSUJI, HSU and U.S. Patent No. 6,552,421 to Kishimoto, et al. (hereinafter "KISHIMOTO"). Claims 14 and 16 were rejected under 35 U.S.C. §103(a) as being unpatentable over the combination of TSUJI and KISHIMOTO. The remaining Claims 5, 6, 8-10 and 17-19 were objected to as being dependent on a rejected base claim, but indicated by the Examiner to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicant gratefully acknowledges the Examiner's indication of allowable subject matter in Claims 5, 6, 8-10 and 17-19. However, for the following reasons, Applicant respectfully submits that all of the pending Claims 1-20 are now in condition for allowance.

1. *Independent Claim 1 is not Rendered Obvious by the Combination of TSUJI and HSU*

In the Office Action, the Examiner rejected independent Claim 1 as being unpatentable over TSUJI in view of HSU, asserting that TSUJI teaches most of the aspects of the invention as recited in Claim 1, except for the feature of an exposed land that is substantially contiguous with the bottom surface of an interposer body. To satisfy this admitted deficiency of TSUJI, the Examiner relies on the HSU reference, and in particular the purported teaching therein of exposed lands which are contiguous with a die pad while being flush with a dielectric layer. In this regard, the Examiner concludes that it would have been obvious to one having ordinary skill in the art to incorporate the teachings of HSU into the device of TSUJI in order to have an exposed land substantially contiguous with the bottom surface of an interposer body to reduce package size.

In Figure 3C highlighted by the Examiner, TSUJI discloses a semiconductor device 31c including a lead frame 45 embedded within refractory glass layers 46 and 46A, as well as a crystallized glass layer 48. The glass layers 46 and an aluminum film 42 applied thereto are supported by a ceramic base 41, with a cap 49 being applied to the glass layers 46A, 48. The cap 49 also covers a semiconductor chip 44 which is mounted to the aluminum film 42 by an adhesive 43 and electrically connected to the lead frame 45 by wires 47.

In Figure 3 highlighted by the Examiner, HSU shows a device including a lead frame 10 having die pad 11 and a plurality of leads 13, each of the leads 13 including an exposed end 131. Attached to the top surface of the die pad 11 is a chip 20 which is electrically connected to the leads 13 by wires 21. The chip 20, wires 21 and portions of the die pad 11 and leads 13 are covered by an encapsulant 30.

Independent Claim 1 in its current form recites, in pertinent part, the feature of “...*each of the interposer leads defining an exposed land which is substantially contiguous with the bottom surface of the interposer body.*” In the semiconductor device 31c shown in Figure 3C of TSUJI, the “land” of any lead within the lead frame 45 is defined by the bent portion of such lead which protrudes outwardly from the glass layers 46, 46A. Clearly, any such land defined by those portions of the leads of the lead frame 45 which are exposed in the semiconductor device 31c are not *substantially contiguous* with the bottom surface of any glass layers 46. Even assuming, arguendo, that the portion of each lead of the lead frame 45 which is exposed between the glass layers 46 or between the glass layers 46A, 48 defines a “land”, such land is also clearly not *substantially contiguous* with the bottom surface of any glass layers 46.

As indicated above, in the subject Office Action the Examiner has recognized this deficiency in TSUJI, and relies upon Figure 3 of HSU for its purported teaching of exposed lands 10 which are contiguous with a die pad while being flush with a dielectric layer 30. In this regard, as also indicated above, the Examiner concludes that it would have been obvious to one having ordinary skill in the art to incorporate the teachings of HSU into the device of TSUJI “in order to have the exposed land is substantially contiguous with the bottom surface of the interposer body to reduce the package size.”

In view of the Examiner's recognition of the deficiencies of TSUJI standing alone in relation to Claim 1, Applicant believes that the indication on page 2 of the subject Office Action that Claims 1-3 and 7 are also rejected under 35 U.S.C. Section 102(b) as being anticipated by TSUJI is in error.

It is well settled that a modification which renders a reference unsatisfactory for its intended purposes is improper. *In re Gordon*, 733 F.2d 900, 902 (Fed. Cir.1984). In the subject Office Action, the Examiner has provided no rationale whatsoever for hypothetically modifying TSUJI in a manner which results in any lead of the lead frame 45 defining a "land" which is "substantially contiguous" the bottom surface of any of the glass layers 46 as shown in Figure 3C thereof. Indeed, Applicant respectfully submits that such hypothetical modification of the semiconductor device 31c of TSUJI would compromise if not destroy the intended functionality thereof since the positioning of the leads of the lead frame 45 at the bottom surfaces of the glass layers 46 would cause such leads to contact and interfere with the aluminum film 42 which is applied directly to the bottom surfaces of the glass layers 46 as indicated above. In this regard, such interference would defeat the functionality of the glass layers 46 which are used to provide an insulative layer between the leads of the lead frame 45 and the aluminum film 42 to which the semiconductor chip 44 is mounted and is electrically connected by at least one wire 47 as shown in Figure 3C.

Simply stated, considering the explicit teachings of TSUJI in relation to Figure 3C thereof, Applicant respectfully submits that one of ordinary skill in the art would clearly not be motivated to modify the structure of the semiconductor device 31c so as to make any land defined by those portions of the leads of the lead frame 45 which are exposed in the semiconductor device 31c to be substantially contiguous with the bottom surface of any glass layers 46. Along these lines, Applicant further submits that even assuming the combination of TSUJI and HSU is appropriate (which Applicant disputes), the only manner such combination could be effectuated without destroying the functionality of the semiconductor device 31c of TSUJI would be to modify such semiconductor device 31c in view of HSU such that the external lands defined by leads of the lead frame 45 are substantially flush or continuous with the bottom surface of the ceramic base 41. However, even with such hypothetical modification of the semiconductor device 31c of TSUJI, the features of Claim 1

highlighted above are still not taught or suggested since such modified semiconductor device 31c still lacks interposer leads which each define an exposed land which is substantially continuous with the bottom surface of the interposer body. In this regard, in the subject Office Action, the Examiner has correlated the interposer body of Claim 1 to the glass layers 46, 46a, 48, and not to the ceramic base 41.

Thus, based on the foregoing, Applicant respectfully submits that independent Claim 1 in its current form is not rendered obvious by the combination of TSUJI and HSU, and is in condition for allowance. Additionally, Applicant respectfully submits that Claims 2-10 are also in condition for allowance as being dependent upon an allowable base claim, Claims 5, 6 and 8-10 having been merely objected to by the Examiner as indicated above.

2. Independent Claim 11 is not Rendered Obvious by TSUJI

In the Office Action, the Examiner rejected independent Claim 11 as being unpatentable over Figure 3C of TSUJI in view of Figure 11B of TSUJI, asserting that Figure 3C of TSUJI teaches all of the features recited in Claim 11, except for the feature relating to the adhesive tape layer attached to the top surface of the die pad. The Examiner asserts that Figure 11B of TSUJI teaches an adhesive tape layer attached to the top surface of a die pad, and concludes that it would have been obvious to combine Figures 3C and 11B to result in the invention as recited in Claim 11.

The pertinent teachings of Figure 3C of TSUJI have been described above. Figure 11B of TSUJI discloses a semiconductor device 131 comprising a base 132 having a metallic film 133 formed on the top surface thereof. A semiconductor chip 134 is mounted on and fixed to the center part of the metallic film 133 by an adhesive 135. Formed around the semiconductor chip 134 and disposed on the metallic film 133 is a crystalline refractory-glass pattern or layer 136 which is separated from the semiconductor chip 134 by openings 137. Also disposed on both the metallic film 133 and the base 132 is a refractory-glass layer 138. The semiconductor device 131 further includes a lead frame 139 having outer leads 140a extending outside of the package, and inner leads 140b which are located inside the package. The inner leads 140b are positioned on the glass layers 136, 138 as is clearly shown in Figure

11B of TSUJI. A third refractory-glass layer 143 is disposed on the outermost periphery of the inner leads 140b, a cap 144 in turn being fixed to the glass layer 143.

Claim 11 in its current form recites, in pertinent part, the features of “...*a layer of adhesive tape having a first surface attached to the top surface of the die pad and extending along the peripheral edge thereof...and a plurality of electrically conductive interposer leads attached to a second surface of the adhesive tape which is opposite the first surface...*”

As indicated above, in the subject Office Action the Examiner acknowledges that Figure 3C of TSUJI fails to show the layer of adhesive tape recited in Claim 11, and thus makes reference to Figure 11B of TSUJI to remedy this deficiency, arguing that Figure 11B “shows a layer of adhesive tape (136) having a first surface attached to the top surface of the die pad (135) and an interposer lead (140a) attached to the second surface of the adhesive tape.” Thus, as indicated on page 4 of the subject Office Action, the Examiner correlates the glass layer 136 shown in Figure 11B of TSUJI and described in column 8 of the specification thereof to the “adhesive tape” feature of Claim 11.

Applicant respectfully submits that such correlation is in error, since TSUJI is devoid of any teaching or suggestion regarding a layer of “adhesive tape” which is used to secure the inner leads 140b of the lead frame 139 shown in Figure 11B to the metallic film 133. Rather, as indicated above, the teachings of TSUJI in the context of Figure 11B are confined to the positioning of the inner leads 140b upon the glass layers 136, 138. Further, due to the substantial overlap in the teachings of TSUJI in relation to Figures 3C and 11B, Applicant respectfully submits that TSUJI is further devoid of any teaching or suggestion which would motivate one of ordinary skill in the art to substitute the glass layer 46 shown in Figure 3C with the virtually identical glass layer 136 shown in Figure 11B.

Thus, based on the foregoing, Applicant respectfully submits that independent Claim 11 in its current form is not rendered obvious by TSUJI, and is in condition for allowance. Additionally, Applicant respectfully submits that Claims 12-19 are also in condition for allowance as being dependent upon an allowable base claim, Claims 17-19 only having been objected to by the Examiner as indicated above.

3. *Independent Claim 20 is not Rendered Obvious by the Combination of TSUJI, HSU and KISHIMOTO*

In the subject Office Action, independent Claim 20 was rejected as being unpatentable over TSUJI in view of HSU and KISHIMOTO. In rejecting Claim 20, the Examiner stated that Figure 3C of TSUJI combined with Figure 3 of HSU shows most aspects of the invention except a “bottom terminal surface which is generally coplanar with the bottom surface of the die pad”, such feature being disclosed in KISHIMOTO

Similar to Claim 1, independent Claim 20 in its current form recites, in pertinent part, the feature of “...*the bottom terminal surface being substantially contiguous with the non-conductive barrier means.*” As argued above in relation to Claim 1, in the semiconductor device 31c shown in Figure 3C of TSUJI, any “land” defined by any lead within the lead frame 45 is not *substantially contiguous* with the bottom surface of any glass layers 46 or other non-conductive barrier. Additionally, for the same reasons also discussed in relation to Claim 1 above, Applicant respectfully submits that this deficiency of TSUJI is not remedied by any reliance upon the teachings of HSU. This deficiency is also not remedied by KISHIMOTO, Figure 1 of which (highlighted by the Examiner) shows nothing more than a lead 5 which defines a land disposed outside of a package body 2 and spaced from the peripheral edge of a die pad 3 which is partially embedded within the package body.

Thus, based on the foregoing, Applicant respectfully submits that independent Claim 20 is not rendered obvious by the combination of TSUJI, HSU and KISHIMOTO, and is in condition for allowance.

4. *Conclusion*

On the basis of the foregoing, Applicant respectfully submits that the stated grounds of rejection have been overcome, and that Claims 1-20 are now in condition for allowance. Additionally, Applicant respectfully submits that the present response does not introduce new issues which would require further searching on the part of the Examiner, and therefore respectfully requests that the same be considered and entered by the Examiner. An early Notice of Allowance is therefore respectfully requested.

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Respectfully submitted,

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